Thesis description

My thesis explores real-time operating systems and their internals, with a specific focus on scheduling and scheduling algorithms fit for hard real-time systems. The scheduling problem is described, and solutions in the form of the Rate Monotonic and Earliest Deadline First scheduling algorithms are discussed, along with their respective schedulability analysis methods. As part of the schedulability analysis, worst-case execution time estimation is also discussed, focusing on an estimation method making use of Extreme Value Theory. Ways of incorporating aperiodic, non-real-time jobs into the system, such as the Total Bandwidth Server, are discussed, but ultimately left unimplemented in the interest of time. Implementation-wise, the thesis details the process of porting the µC/OS-III real-time operating system to commodity hardware (a first-generation Raspberry Pi), along with the replacement of its built-in fixed priority scheduler by a guarantee-backed Earliest Deadline First scheduler. Experimentally, the EDF scheduler is evaluated and contrasted with the built-in scheduler when priorities are set according to the Rate Monotonic algorithm.